

REMARKS

Applicants have requested a Suspension of Action. Applicants hereby request continuance of prosecution.

Claims 1, 4 to 7, 12, 15 and 16 are all the claims pending in the application, prior to the present Amendment.

Applicants have amended claims 1 and 4 which are the only independent claims in the application to recite “1.1 to 5 groups per one molecule . . .” Support for this amendment can be found in the paragraph at page 5, lines 4-19 of the specification.

Applicants have added new claims 17-24. Support for new claims 17-19 and 21-24 can be found in Table 3 of the specification. Support for new claim 20 can be found in the paragraphs at page 10, line 15, to page 12, line 11.

By way of background, there have previously been known organic polymers with the molecular chain terminals thereof capped with reactive silicon groups by taking advantage of the high reactivity between the isocyanate group and various types of active hydrogen groups, and accordingly, properties of urethane resins have been improved.

Curable compositions including these organic polymer are cured with silanol condensation catalysts, and organotin catalysts such as dibutyltin dilaurylate are widely used. However, cured articles obtained from the curable compositions each including any of the organic polymers and an organotin catalyst are poor in heat resistance, leading to a problem that physical properties of the cured articles are largely degraded by heating. Additionally, organotin

catalysts having carbon-tin bonds have recently been pointed out to be toxic. See the BACKGROUND ART section of the present specification.

In this environment, the present invention takes, as its object, the provision of a curable composition capable of giving a cured article excellent in heat resistance and curability.

The curable composition of the present invention, as recited in independent claims 1 and 4, comprises:

an organic polymer (A) which has on average 1.1 to 5 groups per one molecule thereof each represented by the general formula (1) and has one or more silicon-containing functional groups capable of cross-linking by forming siloxane bonds:



wherein R¹ is a hydrogen atom, or a substituted or unsubstituted monovalent organic group; and

a component (B) which is a tin carboxylate, wherein the carbon atom adjacent to the carbonyl group of tin carboxylate is a quaternary carbon atom, or

a component (B) which is a carboxylic acid, wherein the carbon atom adjacent to the carbonyl group of the carboxylic acid is a quaternary carbon atom.

The present invention employs a combination of the specific component (A) and the specific tin carboxylate (claim 1) or the specific carboxylic acid (claim 4) to provide excellent heat resistance and curability. Applicants enclose a Declaration Under 37 C.F.R. § 1.132 by Mr. Okamoto, one of the inventors of the present application, in support of the patentability of

the present claims. Applicants note that the heat resistance property is measured by the M50 retention rate.

According to amended claim 1, since the curable composition comprises the organic polymer (A) having a specific amount of an amide bond and the tin carboxylate having a specific molecular architecture, the curable composition provides a rapid curing rate and excellent heat resistance simultaneously. This is clear from the present specification and Experiment Nos. 1 to 5 in the Declaration.

Moreover, according to amended claim 4, since the curable composition comprises the organic polymer (A) having a specific amount of an amide bond and the carboxylic acid having specific molecular architecture, the curable composition provides a rapid curing rate and excellent heat resistance simultaneously. This is clear from the present specification and Experiment Nos. 6 to 11 in the Declaration.

Further, applicants believe the present invention provides the above-mentioned effect according to the following explanation.

As shown in the Declaration, a hydrolyzable silyl group-containing organic polymer which has an amide bond (an amide bond includes a urethane bond and a urea bond) tends to be inferior to heat resistance from a hydrolyzable silyl group containing organic polymer free from an amide bond. About this reason, applicants estimate that the curing catalyst required for the silanol condensation remains in a hardened material and, as a result, the amide bond in the organic polymer is cleaved by the curing catalyst. Further, although a reduced heat resistant is observed in Experiment No. 13 of the Declaration which uses a hydrolyzable silyl group-

containing organic polymer free from an amide bond, it is thought that a portion of a siloxane bond is cleaved.

Generally, since a catalyst having a high silanol-condensable activity has also a high activity as the catalyst for forming urethane bond, if such a catalyst is used, the amide bond in the organic polymer is cleaved easily. That is, in the conventional curable composition comprising a hydrolyzable silyl group-containing organic polymer which has an amide bond, a curable composition providing a rapid curing rate and excellent heat resistance simultaneously is not known.

On the other hand, the present inventors consequently found that heat resistance is improved when a tin carboxylate or the carboxylic acid having a low activity for forming urethane bond is used as the catalyst, and further found that a silanol-condensable activity is increased when the tin carboxylate or the carboxylic acid having a specific molecular architecture about the carbon atom adjacent to the carbonyl group is used as the catalyst. As a result, the present inventors achieved the present invention having a rapid curing rate and excellent heat resistance simultaneously.

Therefore, since the curable composition of the present invention comprises a tin carboxylate or a carboxylic acid in which the carbon atom adjacent to the carbonyl group is a quaternary carbon atom, the curable composition provides a rapid curing rate and excellent heat resistance simultaneously.

Turning now to claim 1, applicants submit that the invention of amended claim 1 is patentable over the Fukunaga et al patent, as evidenced by Singh, that was employed in the Advisory Action of March 10, 2009 against claim 1.

As already explained above, amended claim 1 recites a curable composition comprising a specific organic polymer (A) and a specific tin carboxylate. The organic polymer (A) has on average 1.1 to 5 groups per one molecule thereof each represented by general formula (1), and the tin carboxylate has a quaternary carbon atom adjacent to the carbonyl group.

The curable composition of amended claim 1 provides a rapid curing rate and excellent heat resistance simultaneously. This effect is an unexpected effect over the teachings by Fukunaga et al. This effect is unexpected because Fukunaga et al (as evidenced by Singh) do not teach or suggest that the curable composition provides the above-mentioned effect, when the curable composition comprises a specific organic polymer (A) and a specific tin carboxylate. Further, this effect is demonstrated in the Examples of the present specification and the enclosed Declaration. See, for example, Example 5 of the present specification.

Fukunaga et al do not provide any working Example of a curing composition that comprises a tin carboxylate having a quaternary carbon atom adjacent to the carbonyl group, and contain no discussion that such a tin carboxylate produces an unexpected effect. Of course, the unexpected effect of the invention set forth in claim 1 cannot be obvious from the teachings by Fukunaga et al.

In other words, the inventive concept of the present invention as set forth in claim 1 is clearly distinct from that of Fukunaga et al. A person of ordinary skill in the art would not

recognize the concept or effect of the invention set forth in claim 1 from the teachings of Fukunaga et al.

Additionally, regarding new claim 20, it recites that the curable composition is produced by the specific production methods (a) or (b).

On the other hand, Fukunaga et al and/or Singh do not teach or suggest these specific production methods (a) and (b).

Turning now to claim 4, applicants submit that the invention of amended claim 4 is patentable over Fukunaga et al, as evidenced by Singh, EP '881 to Suzuki et al and WO '978 to Okamoto et al, which are the documents that were employed against claim 4 in the final Office Action of September 25, 2008.

As already explained above, amended claim 4 recites a curable composition comprising a specific organic polymer (A) and a specific carboxylic acid. The organic polymer (A) has on average 1.1 to 5 groups per one molecule thereof each represented by general formula (1), and the carboxylic acid has a quaternary carbon atom adjacent to the carbonyl group.

The curable composition of amended claim 4 provides a rapid curing rate and excellent heat resistance simultaneously. This effect is unexpected. This effect is unexpected because Suzuki et al and Okamoto et al do not teach or suggest that the curable composition provides the above-mentioned effect, when the curable composition comprises a specific organic polymer (A) and a specific carboxylic acid. Further, Suzuki and Okamoto do not teach the inventive concept of amended claim 4, either.

Still further, this effect is demonstrated in the Examples of the present specification and the enclosed Declaration. See, for example, Example 7 of the present specification.

Therefore, even if Suzuki et al and Okamoto et al are considered, a person of ordinary skill in the art would not recognize the concept and effect of amended claim 4 from the teachings of Suzuki et al and Okamoto et al.

In addition, Fukunaga et al do not teach the curable composition in which the component (B) is the specific carboxylic acid of claim 4.

The Examiner has argued that EP '881 to Suzuki et al teach the use of a carboxylic acid in place of organometallic compounds in curing a specific polymer.

However, the carboxylic acid in claim 4 is a carboxylic acid that has a quaternary carbon atom adjacent to the carbonyl group of the carboxylic acid. EP '881 to Suzuki et al do not teach the use of such a carboxylic acid.

Suzuki et al exemplify various types of carboxylic acids, such as aliphatic monocarboxylic acids, aliphatic dicarboxylic acids, aliphatic polycarboxylic acids, aromatic carboxylic acids and other amino acids. See page 4, lines 24 to 58. These examples do not include any carboxylic acid that has a quaternary carbon atom adjacent to the carbonyl group of the carboxylic acid.

The Examiner also has stated that Okamoto et al teach that "the carboxylic acid from which the metal carboxylate is formed is preferably neodecanoic acid," and refers to column 15, lines 61 to 65 and column 16, lines 58 to 65 of the corresponding U.S. 7,115,695 to Okamoto et al as support for his position.

Applicants submit, however, that the Examiner has not correctly analyzed the teachings of Okamoto et al. Applicants submit that Okamoto et al do not use any free carboxylic acid that has a quaternary carbon atom adjacent to the carbonyl group.

In particular, the portions of Okamoto et al which the Examiner has referred to are part of a description of component (B) of Okamoto et al which begins at column 14, line 35, where Okamoto et al state that component (B) is a carboxylic acid metal salt. See also, column 2, lines 55-60, column 14, lines 6 to 65 and claims 1 and 5 of Okamoto et al for a description of component (B).

Thus, the various carboxylic acids disclosed at column 15, line 61, to column 16, line 8 of Okamoto et al are examples of the carboxylic acid functionality in such acid metal salts. Okamoto et al do not disclose the use as a catalyst of any free carboxylic acid wherein a carbon atom adjacent to the carbonyl group is a quaternary carbon atom.

Accordingly, Okamoto et al do not teach the use as a catalyst of a **free** carboxylic acid that has a quaternary carbon atom adjacent to the carbonyl group. This is also apparent from the above expression of the Examiner “the carboxylic acid from which the metal carboxylate is formed.” The expression means that a “carboxylic acid” in Okamoto et al is a carboxylic acid residue that is present in the metal carboxylate.

This can be recognized clearly from the description in U.S. 7,115,695 to Okamoto et al, at column 14, lines 35 to 65 which states:

The component (B) contain, as the main ingredient, **carboxylic acid** metal salts represented by the general formulas (2) to (12). . . .

As the carboxylic acid, a C2-40 (including carbonyl carbon) hydrocarbon carboxylic acid group-containing compound can be preferably used . . .”

Further, claim 5 of Okamoto recites “. . . wherein the carboxylic acid metal salt as the component (B) is a metal salt of a carboxylic acid group-containing compound selected from . . . neodecanoic acid . . .”

It is apparent from this claim 5 of Okamoto et al that the disclosure of neodecanoic acid in Okamoto et al is with respect to a metal salt of neodecanoic acid as an example of the component (B), and is not a disclosure of the use a free “carboxylic acid” as required by claim 4 of the present application.

Thus, Okamoto et al do not teach use of free “carboxylic acid.”

Moreover, applicants explain the substantial reasons that the effect provided by the present invention, specifically amended claim 4, is an unexpected effect.

For example, the previously cited U.S. Patent 4,720,530 to Wurminghausen et al disclosed using various carboxylic acid as a catalyst for curing a RTV silicone paste. Wurminghausen et al investigated the time for Shore A hardness of 5 in Table 1. In Table 1 of Wurminghausen et al, it is shown the time of pivalic acid as a quaternary carboxylic acid becomes longer than for 2-ethylhexanoic acid as a tertiary carboxylic acid and for linoleic acid as a secondary carboxylic acid. Further, these catalysts form a silanol condensation.

For this reason, at the time of filling the present application, it was not common general technical knowledge that a carboxylic acid having a quaternary carbon atom adjacent to the carbonyl group as a curing catalyst provides a rapid curing rate.

As can be seen from the above discussion, amended claim 4 is patentable over Fukunaga et al, Suzuki et al and Okamoto et al.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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